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# A model four-phase square checkerboard structure

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## Abstract

Two-dimensional multi-phase doubly-periodic composites are considered with the emphasis upon a structure that is a four-phased square checkerboard. The structure of the checkerboard is such that it reduces to an oft-studied two-phase checkerboard on two scales; as such it is of interest as a generalization of the classical results. The structure under investigation eventually reduces to the study of a 4 × 4 matrix Riemann-Hilbert problem: in general this appears not solvable. However, two types of special cases are reducible to 2 × 2 matrix problems that are. These two cases are solved in detail and effective parameters are extracted. Our purpose is two-fold: to explore the matrix Riemann-Hilbert system and to find effective properties of the structure. 

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